CLAIMS

1. Multi-element impedance probe apparatus, adapted to produce an image of a body tissue, having a structure, comprising:

a raster of sensors, comprised of a substantially radiolucent, conductive material;

substantially radiolucent conductive wiring, forming conductive connections with the sensors; and

a substantially radiolucent substrate, on which the sensors are mounted.

2. Apparatus according to claim 1, comprising two impedance probes which operate in tandem, one acting as an electrifying source and the other as a sensor.

3. Apparatus according to claim 1 or claim 2 and including a conductive layered structure, covering the surface of the probe and suitable for providing an interface between the probe and the tissue.

4. Apparatus according to claim 3, wherein the structure comprises a material having conductivity substantially similar to the conductivity of the tissue.

5. Apparatus according to claim 3 or claim 4, wherein the structure is radiolucent.

6. Apparatus according to any of the preceding claims, wherein the impedance probe comprises an aligning feature.

7. Apparatus according to claim 6, wherein the aligning feature comprises at least one alignment mark that is opaque to x-rays.

8. Apparatus according to claim 6 or claim 7, wherein the aligning feature comprises at least one alignment mark that emits γ rays.

9. Apparatus according to any of claims 6-8, wherein the aligning feature comprises at least one alignment mark that emits pairs of positrons.

10. Apparatus according to any of claims 6-9, wherein the aligning feature comprises at least two lines, a substantial distance apart with respect to the size of the impedance probe.

11. Apparatus according to any of claims 6-10, wherein the aligning feature comprises at least two intersections, a substantial distance apart with respect to the size of the impedance probe.

12. Apparatus according to any of claims 6-11, wherein the aligning feature comprises an outline of the probe painted on a surface against which the impedance probe is positioned.

13. Apparatus according to any of claims 6-12, wherein the aligning feature comprises a detachable mount to which the impedance probe is attached during operation thereof.

14. Apparatus for tissue examination comprising:

an impedance imager comprising at least one impedance probe with a first field of view and adapted to produce an impedance image of a body tissue, referenced to a reference indicator; and

at least one additional imager of a modality different from impedance imaging, having a second field of view, at least partially common to the first field of view, and adapted to produce an image of body tissue, referenced to the reference indicator.

15. Apparatus according to claim 14 wherein the impedance imager comprises probe apparatus according to any of claims 1-13.

16. Apparatus according to claim 14 or claim 15, wherein the reference indicator is comprised in a structure that provides positioning of at least one of the imagers.

17. Apparatus according to any of claims 14-16, wherein the impedance imager and the at least one additional imager form an integral unit.

18. Apparatus according to any of claims 14-16, wherein:

the impedance imager is a first module; and

each additional imager is an additional module,

wherein the modules may be used independently or together.

19. Apparatus according to any of claims 14-18 and including a processing unit common to the impedance imager and the at least one additional imager for processing the images.

20. Apparatus according to any of claims 14-19 and including a display unit common to the impedance imager and the at least one additional imager, wherein the display unit is operative to selectively display each image individually or the images superimposed.

21. Apparatus according to any of claims 14-20 and including a control panel common to the impedance imager and the at least one additional imager.

22. Apparatus according to any of claims 14-21 and including a biopsy device, adapted to perform biopsy on the tissue.

23. Apparatus according to any of claims 14-22, wherein the at least one additional imager comprises an x-ray imager.

24. Apparatus according to any of claims 14-23, wherein the at least one additional imager comprises a mammogram comprising:

an x-ray tube, which produces a beam of x-rays;

a support plate, adapted to support the tissue when it is irradiated by the x-ray tube;

an x-ray image receptor, associated with the support plate and adapted to produce an x-ray image of the tissue,

wherein the at least one impedance probe is located between the x-ray tube and the x-ray image receptor.

25. Apparatus for x-ray mammography and impedance imaging, comprising:

an x-ray tube, which produces a beam of x-rays;

a support plate, adapted to support a soft body tissue when it is irradiated by the x-ray tube;

an x-ray image receptor, associated with the support plate and adapted to produce an x-ray image of the tissue, referenced to a reference indicator;

an impedance imager, comprising at least one impedance probe, located between the x-ray tube and the x-ray image receptor, having a field of view that is at least partially common to a field of view of the x-ray tube and adapted to produce an image of body tissue, referenced to the reference indicator.

26. Apparatus according to claim 24 or claim 25 and including a compression plate, adapted to travel between the x-ray tube and the support plate and to provide compression against the tissue.

27. Apparatus according to any of claims 24-26, wherein the at least one impedance probe is comprised in the compression plate.

28. Apparatus according to any of claims 14-22, wherein the at least one additional imager comprises a CT imager.

29. Apparatus according to claim 27 or claim 28 and including a gamma camera, having a field of view that is at least partially common to a field of view of the at least one impedance probe, wherein the gamma camera is adapted to produce a gamma-ray image of the tissue, referenced to the reference indicator.

30. Apparatus according to any of claims 14-22, wherein the at least one additional imager comprises a gamma camera.

31. Apparatus according to claim 29 or claim 30, wherein the at least one impedance probe is attached to the gamma camera with a fixed mechanical attachment, in a field of view of the gamma camera, at a specific distance from the gamma camera.

32. Apparatus according to any of claims 14-22, wherein the at least one additional imager comprises a SPECT imager.

33. Apparatus according to any of claims 14-22, wherein the at least one additional imager comprises a PET imager.

34. Apparatus according to any of the preceding claims, wherein the tissue is human tissue.

35. A composition of matter that is a physiologically acceptable organic salt which is both an agent that enhances impedance imaging and a radio-pharmaceutical agent.

36. A composition of matter according to claim 35, which is also an agent that enhances x-ray imaging.

37. A composition of matter according to claim 35 or claim 36, wherein the radio-pharmaceutical agent emits gamma rays.

38. A composition of matter according to any of claims 35-37, wherein the radio-pharmaceutical agent emits positron pairs.

39. A composition of matter according to any of claims 35-38, wherein the radio-pharmaceutical agent is selected from a tri-iodo group in which a stable iodine isotope is replaced by a radioactive iodine isotope.

40. A composition of matter according to any of claims 35-39, wherein the radio-pharmaceutical agent is selected from a tri-iodo group in which any of stable C, O and N isotopes are replaced with any of positron emitting ^{11}C, ^{15}O and ^{13}N isotopes.

41. A composition of matter according to any of claims 35-40, wherein the radio-pharmaceutical agent is a paramagnetic iron ion wherein the stable iron isotope is replaced by ^{52}Fe isotope.

42. A method of imaging a body tissue by an impedance imager and by an additional imager of a modality different from impedance imaging, comprising:

positioning an impedance probe of an impedance imager so that at least a portion of a field of view of the impedance probe is common with at least a portion of a field of view of the additional imager;

acquiring an impedance image, referenced to a reference indicator; and

acquiring an image of the additional imager, referenced to the reference indicator.

43. A method according to claim 42, wherein acquiring an impedance image comprises acquiring an impedance image with apparatus according to any of claims 1-13.

44. A method according to claim 42 or claim 43, wherein positioning comprises attaching to a structure of the additional imager.

45. A method according to claim 42 or claim 43, wherein positioning comprises attaching to the body tissue.

46. A method according to any of claim 42-45 and including removing the impedance probe before acquiring the image of the additional imager.

47. A method according to claim 46, wherein removing comprises removing by sliding, without substantially moving or disturbing the tissue.

48. A method according to claim 46, wherein:

acquiring an impedance image comprises acquiring an impedance image with apparatus according to claim 13; and

removing comprises removing the impedance probe from the detachable mount, while leaving the detachable mount in place.

49. A method according to any of claims 42-48, wherein acquiring an image of the additional imager comprises acquiring an x-ray image.

50. A method according to claim 49, wherein acquiring an image of the additional imager comprises acquiring a mammography image.

51. A method according to any of claims 42-48, wherein acquiring an image of the additional imager comprises acquiring an x-ray CT image.

52. A method of imaging in accordance with any of claims 42-51 and including administering a dual-purpose contrast agent, effective for enhancing the contrast of a desired feature both on the x-ray image and on the impedance image.

53. A method according to any of claims 42-48, wherein acquiring an image of the additional imager comprises acquiring a SPECT image.

54. A method according to any of claims 42-48, wherein acquiring an image of the additional imager comprises acquiring a PET image.

55. A method according to any of claims 42-54 and including acquiring a gamma-ray image, referenced to the reference indicator.

56. A method according to any of claims 42-48, wherein acquiring an image of the additional imager comprises acquiring a gamma-ray image.

57. A method of imaging in accordance with any of claims 42-56 and including administering a contrast agent which is a composition of matter in accordance with any of claims 35-41.

58. A method according to any of claims 42-57 and including performing a biopsy on the tissue utilizing a biopsy needle.

59. A method according to claim 58, wherein the biopsy needle is an impedance-guided biopsy needle.

60. A method according to claim 58 or claim 59 wherein the biopsy is performed under guidance of impedance images acquired during insertion and positioning of the biopsy needle.